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ASSESSMENT OF BURN WOUND INFECTION BY SWAB CULTURE AND BIOPSY, CULTURE: A COMPARATIVE STUDY

Dr. Jyotirmaya Nayak[1], Dr Sridhar Panda[2], Dr Chandan Das[3], Dr Umesh Chandra singh[4]

[1]Assistant Professor, Dept of General Surgery, SCB Medical College, Cuttack

[2]Assistant Professor, Dept of General Medicine, SCB Medical College, Cuttack

[3]Senior Resident, Dept of General Surgery, SCB Medical College, Cuttack

[4]Junior resident, Dept of General Surgery, SCB Medical College, Cuttack

Corresponding author

Dr.Jyotirmaya Nayak

Assistant Professor, Dept of General Surgery, SCB Medical College, Cuttack

Address- Department of General Surgery, SCB medical college and hospital, Manglabag, Cuttack-753007

drjmnayak@gmail.com

ABSTRACT-

Introduction-

It is estimated that infection accounts for 50-75% of death in burn patients following first resuscitation. The most common cause of burn wound sepsis is superficial bacterial infection of the lesion, which may progress to invasiveness. It has been shown that the degree of bacterial wound infection correlates directly with the likelihood of wound sepsis. The risk of invasive burn wound infection is determined by patient parameters such as age, amount of damage, and depth of burn, as well as microbial factors such as kind and quantity, enzyme and toxin production, and organism motility.

MATERIAL AND METHODS

Patients

All patients who completed an informed permission form and had full-thickness burns that covered more than 20% of their total body surface area (TBSA) were examined. They were tracked until they were discharged or died. During this time, 75 instances were investigated. Criteria for exclusion:

1) Burns that cover less than 20% of the body's surface area
2) Patients suffering from inhalational burns
3) Patients who died or were released from the hospital in less than 10 days
4) Patients who refused to provide consent.

RESULTS-

A total of 75 patients with burn wound were admitted and treated during the study period. The peak incidence of burn injuries was seen in the age group of 20-29 yrs. Increased prevalence was seen among females (84%). The mean age was 26.6 years for males and 24.8 years for females. The average number of days of hospitalization was 28 days. Maximum duration was 60 days and minimum were 10 days. The mean Total Burn Surface Area is 50.5%; minimum being 20% and maximum being 90%.

CONCLUSION

This research reveals that although surface swab and tissue biopsy have a strong association for finding bacteria on and inside burn sites, they do not have adequate predictive value to

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determine clinical outcome. Burn size, on the other hand, has a positive correlation with wound infection and prognosis.

INTRODUCTION

It is estimated that infection accounts for 50-75% of death in burn patients following first resuscitation [1,3]. The risk of invasive burn wound infection is determined by patient parameters such as age, amount of damage, and depth of burn, as well as microbial factors such as kind and quantity, enzyme and toxin production, and organism motility [4]. Bacterial colonisation is easy on exposed charred body surfaces [5]. The most common cause of burn wound sepsis is superficial bacterial infection of the lesion, which may progress to invasiveness [6]. It has been shown that the degree of bacterial wound infection correlates directly with the likelihood of wound sepsis [5]. Various bacterial concentrations have been reported to be required for the formation of burn wound sepsis based on quantitative tissue biopsy cultures. A bacterial level of 1105 bacteria per gramme of tissue has been employed as a diagnostic criterion for invasive infection and septicaemia in most investigations [7,11].

Swab culture and biopsy culture are the most used procedures for microbiological surveillance of burn sites nowadays. The biopsy procedure displays the bacterial burden of the whole wound thickness. It also causes a whole thickness skin defect [6]. Swab culture, on the other hand, is a non-invasive and less costly approach for burn site biopsies than serial dilution culture in differential and selective medium, but it provides no information on deeper layers of the wound [5,6, and12]. Some studies have compared swab and biopsy cultures from wounds of varied aetiology or chronic wounds [12, 14].

AIMS & OBJECTIVES

Severe burns remain a devastating injury affecting nearly every organ system and leading to significant morbidity and mortality. Hence, it becomes imminent for the health care system to put in practice a logistically feasible management strategy for management of burns in Government hospitals. This becomes important in view of the fact that over 80% of general population in India approach only Government hospitals for their health care requirements.

With this aim in mind, the present study was planned and conducted.

The objectives of the project are:

1. to evaluate burn wound infection by different methods of surface swab and tissue biopsy culture bacteriologic
2. to determine the extent to which qualitative swab culture of the burn wound is consistent with tissue biopsy cultures
3. to assess if they can predict the outcome.

MATERIAL AND METHODS

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Culture collection and analysis
Wound culture samples were obtained after repeated clinical assessments during the second week, when burn infection is most likely. Wound swab and biopsy specimens were obtained from the leading edge of wound sites that showed symptoms of infection such as colour, odour, fast separation of the eschar, or the presence of pus. Topical medications were removed using sterile gauze from the location, but the surface was not cleansed prior to swabbing or biopsy. Surface swab gathering
Swabs were used to collect surface samples of wounds, which were then placed in sterile buffer or normal saline to suspend the organisms.
The collecting of biopsies
Tissue biopsies weighing around 1 gramme were taken using a scalpel. One segment of each patient's aliquot was conveyed to the pathology laboratory in sterile normal saline. Following collection, blood samples were cultured. The investigation of the organism
Following selective media (Urea, Triple Sugar Iron Agar (TSI), Methyl Red Voge Proskover (MRVP), Citrate), processed specimens were distributed onto differential medium (EMB and MacConkey for gramme negative organisms, blood and chocolate agar for gramme positive organisms) for 24-48 hours. After 24 and 48 hours of incubation at 37°C, colonies in both mediums were enumerated and classified as wound colonising bacteria.

OBSERVATION

A total of 75 patients with burn wound were admitted and treated during the study period from oct 2022 to Sept 2023. The clinical examinations, Investigations done, treatment given and the associated complications were analyzed and following results obtained.
DEMOGRAPHIC ANALYSIS:
Table 1: AGE AND SEX DISTRIBUTION

AGE	MALE	%	FEMALE	%	TOTAL	%
10-19	0	0	12	16	12	16
20-29	8	10.7	44	58.7	52	69.3
30-39	4	5.3	7	9.3	11	14.7
	12	16	63	84	75	

The peak incidence of burn injuries was seen in the age group of 20-29 yrs. Increased prevalence was seen among females (84%). The mean age was 26.6 years for males and 24.8 years for females.

CAUSES OF BURN INJURY

The common causes of burn was attributed to burns due to kerosene 47(62.7), gas 18(24%), hot water 4 (5.3%), respectively.

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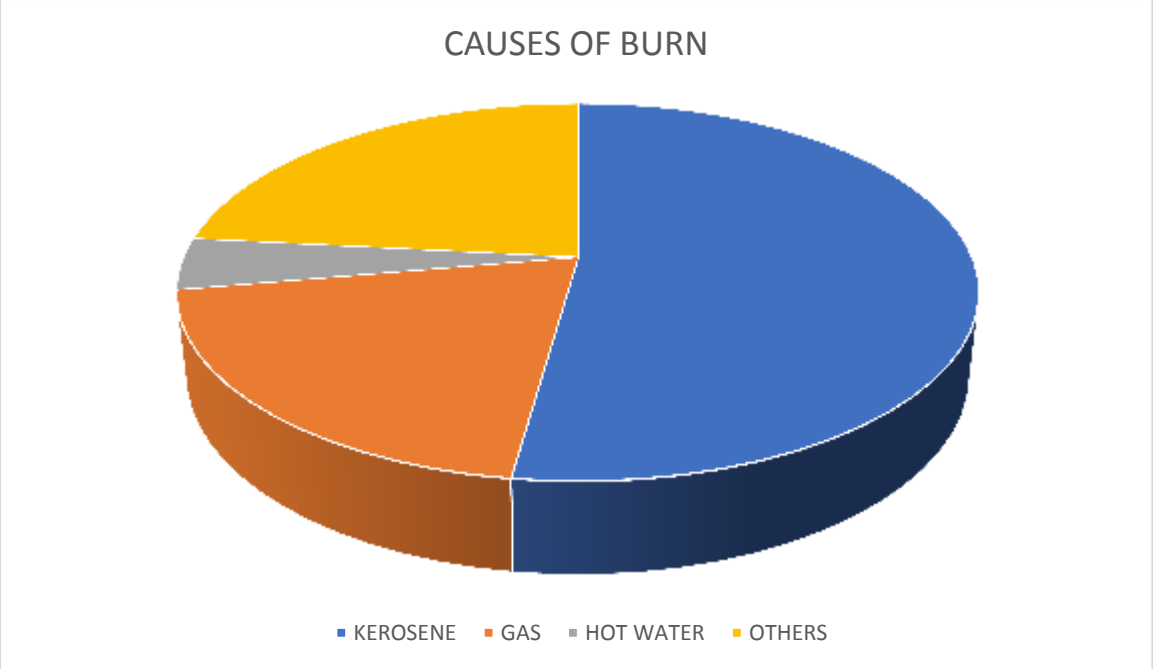

DURATION OF HOSPITALIZATION OF BURN PATIENTS

DURATION OF STAY	NO. OF DAYS
AVERAGE	28
MAXIMUM DURATION	60
MINIMUM	10

The average number of days of hospitalization was 28 days. Maximum duration was 60 days and minimum were 10 days.

TABLE-3
DISTRIBUTION OF BURN AREA AND MORTALITY

TBSA	PTS	%	DEATH	%
20-39	**20**	**26.7**	**0**	**0**
40-59	**35**	**46.7**	**8**	**22.9**
60-79	**14**	**18.7**	**12**	**86**
80-99	**6**	**8**	**6**	**100**
	75		**26**	

The mean Total Burn Surface Area is 50.5%; minimum being 20% and maximum being 90%. Most patients; 35(46.7%) have suffered burn within 40-59%.
Total number of deaths being 26(34.7%).
8(22.9%), 12(86%), 6(100%) patients have died having burn area of (40-59), (60-79) and (80-99) respectively.

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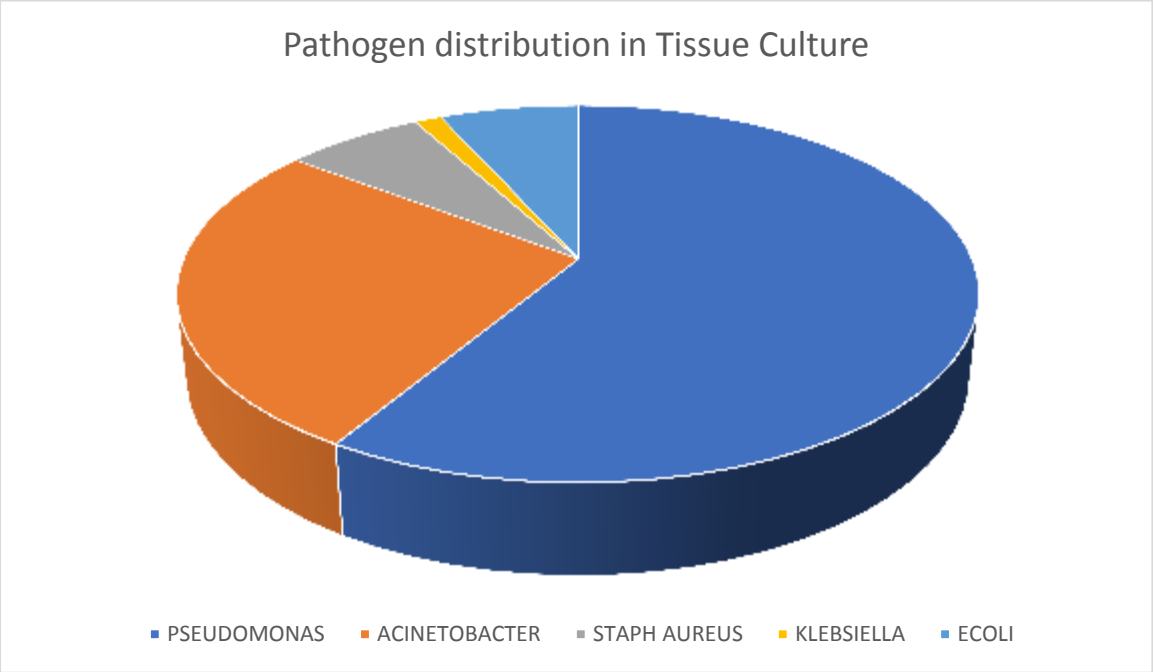
TABLE:4

DIFFERENT PATHOGENS IN DIFFERENT CULTURES

Pathogens	Swab culture	Tissue culture	Blood culture
Pseudomonas aeruginosa	**44**	**42**	**10**
Acinetobacter baumanii	**20**	**16**	**0**
Staphylococcus species	**5**	**10**	**3**
Klebsiella pneumoniae	**1**	**3**	**0**
E coli	**5**	**4**	**1**

Most common pathogen found in all three cultures was Pseudomonas aeruginosa. Next to follow was Acinetobacter baumanii and Staphylococcus.
Pseudomonas was found to grow in 58.7%, Acinetobacter in 26.7%, Staph aureus in 6.7%, Klebsiella in 1.3% and E coli in 6.7 % of swab cultures respectively.

Pathogen distribution in Tissue Culture



Pseudomonas was found to grow in 56%, Acinetobacter in 21.3%, Staph aureus in 13.3%, Klebsiella in 4% and E coli in 5.3 % of tissue cultures respectively.
Pseudomonas was found to grow in 71.4%, Acinetobacter in 0%, Staph aureus in 21.4%, Klebsiella in 0% and E coli in 7.2 % of blood cultures respectively.

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DISCUSSION

Burn wound infection is one of the most common and serious consequences in burn victims [15]. The surface swab with tissue biopsy cultures of burn site specimens was compared in this investigation. Patients were tracked until they were released or died.

26 (34.7%) of the individuals investigated died, indicating a significant mortality rate. The death rate of burnt patients was found to be 38% [3] in a Pakistani research [16]. In a research conducted in Zimbabwe, Sjoberg et al [17] found that mortality was 49%. Furthermore, our hospital is a reference burn centre in Odisha, where the most severe and problematic patients are admitted.

The burn size was larger in the deceased patients than in the survivors, which is consistent with findings from the literature [3,16]. The average age of the deceased patients was the same as that of the survivors. However, a research in Pakistan found that elderly age is a risk factor for death [3].

The length of hospital stay in surviving patients was longer than in dying instances. Pseudomonas aeruginosa was the most common pathogen found in tissue biopsy and swab culture, followed by Acinetobacter. Pseudomonas aeruginosa was the most common pathogen in blood cultures, followed by Staphylococcus aureus.

The average time between burns for which biopsies were conducted was 10 days [18]. A comparison of swab and tissue biopsy culture yielded similar findings for Pseudomonas aeruginosa in 95.5% of cases. Methods yielded equivalent findings for Staphylococcus aureus growth in 50% of instances. Methods produced equivalent findings for Acinetobacter growth in 80% of instances. Steer et colleagues showed a 54% concordance between biopsy and swab cultures of the same pathogens [19].

Wound infection and subsequent sepsis, as logic would indicate, increase death rate; nevertheless, in our investigation, the frequency of positive tissue cultures and bacterial load were not substantially different between deceased patients and those who survived. Steer's investigation in the United Kingdom [19] had similar findings. A connection between bacterial counts and subsequent sepsis was not observed in the other trial undertaken by Steer et al with burns greater than 15% TBSA [20].

In McManus' investigation, quantitative counts reveal no difference between those who were septic and those who were not, eliminating inhalation injury as the primary cause of sepsis rather than wound infection [18]. The first 72 hours of hospitalisation had a significant fatality rate owing to (other acute) electrolyte problems rather than infection.

When compared to surface swab (100%) and tissue biopsy culture (100%), there was a reduced prevalence of positive blood cultures (18.7%) among the dead and those who survived. Both are attributable to the use of prophylactic antibiotics upon patient arrival. Before microbiological culture findings are available, every setting must determine the individual pattern of burn wound bacterial colonisation in order to control wound infection.

CONCLUSION

This research reveals that although surface swab and tissue biopsy have a strong association for finding bacteria on and inside burn sites, they do not have adequate predictive value to determine clinical outcome. Burn size, on the other hand, has a positive correlation with wound infection and prognosis.

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